Claims

1. Method for transforming in an audio signal processor a digital audio signal (X) from the time domain into a different domain, said method including the steps:
- forming (PAR) partitions (x) of transform length N from said digital audio signal (X), which partitions overlap by N/2, wherein N is an integer multiple of '4', **characterised** by:
- performing (TRF) a multiplication of a transform matrix Mh, said transform matrix having a size of N/2 rows and N columns, with each one of said partitions (x) such that succeeding transformed signal partitions (y) are provided,
wherein said transform matrix is constructed in the form:

$$Mh = [a \quad lr(a) \quad b \quad lr(-1*b)] ,$$

wherein 'a' and 'b' are sub-matrices each having N/2 rows and N/4 columns and including '+1' and '-1' values only, and wherein said sub-matrices are linearly independent, whereby said transform matrix multiplication outputs N/2 output values per N input values representing a subsampling by a factor of '2', thereby forming a transformed digital audio signal.

2. Method for inversely transforming in an audio signal processor a transformed digital audio signal (X) into the time domain, which transformed digital audio signal was constructed by the steps:
- forming (PAR) partitions (x) of transform length N from an original digital audio signal (X), which partitions were overlapping by N/2, wherein N is an integer multiple of '4';
- performing (TRF) a multiplication of a transform matrix (Mh), said transform matrix Mh having a size of N/2 rows and N columns, with each one of said partitions (x) such that succeeding transformed signal partitions (y) were

provided,
wherein said transform matrix was constructed in the form Mh = [a lr(a) b lr(-1*b)], wherein 'a' and 'b' were sub-matrices each having N/2 rows and N/4 columns and including '+1' and '-1' values only,
and wherein said sub-matrices are linearly independent,
whereby said transform matrix multiplication had output N/2 output values per N input values representing a subsampling by a factor of '2', thereby having formed a transformed digital audio signal,
said method including the steps:

- performing (ITRF) a multiplication of an inverse transform matrix invMh, said inverse transform matrix having a size of N rows and N/2 columns, with each one of said transformed signal partitions (y) such that succeeding inversely transformed signal partitions (x') of length N are provided,
wherein said inverse transform matrix invMH is constructed by taking the left half of the inverse of a matrix

$$\begin{bmatrix} a & lr(a) & b & lr(-1*b) \\ b & lr(-1*b) & a & lr(a) \end{bmatrix},$$

wherein 'a' and 'b' are sub-matrices as defined above;
- assembling (ASS) said inversely transformed signal partitions (x') in an overlapping manner so as to form an inversely transformed digital audio signal (X'), whereby said overlapping is of size N/2,
and whereby the samples values of said inversely transformed signal partitions (x'), or the samples values of said inversely transformed digital audio signal (X'), or the values of said transformed signal partitions (y) are each scaled by multiplication with factor '1/N' or by a division by 'N' or by a corresponding binary shift operation.

3. Apparatus for transforming a digital audio signal (X)

from the time domain into a different domain, said apparatus including:

- means (PAR) which form partitions (x) of transform length N from said digital audio signal (X), which partitions overlap by N/2, wherein N is an integer multiple of '4';
- means (TRF) which perform a multiplication of a transform matrix Mh, said transform matrix having a size of N/2 rows and N columns, with each one of said partitions (x) such that succeeding transformed signal partitions (y) are provided,

wherein said transform matrix is constructed in the form:

$$Mh = [a \quad lr(a) \quad b \quad lr(-1*b)] ,$$

wherein 'a' and 'b' are sub-matrices each having N/2 rows and N/4 columns and including '+1' and '-1' values only, and wherein said sub-matrices are linearly independent, whereby said transform matrix multiplication means output N/2 output values per N input values representing a sub-sampling by a factor of '2', thereby forming a transformed digital audio signal.

4. Apparatus for inversely transforming a transformed digital audio signal (X) into the time domain, which transformed digital audio signal was constructed by the steps:

- forming (PAR) partitions (x) of transform length N from an original digital audio signal (X), which partitions were overlapping by N/2, wherein N is an integer multiple of '4';
- performing (TRF) a multiplication of a transform matrix (Mh), said transform matrix Mh having a size of N/2 rows and N rows, with each one of said partitions (x) such that succeeding transformed signal partitions (y) were provided,

wherein said transform matrix was constructed in the form Mh = [a lr(a) b lr(-1*b)], wherein 'a' and 'b' were sub-matrices each having N/2 rows and N/4 columns and including '+1' and '-1' values only,

and wherein said sub-matrices are linearly independent, whereby said transform matrix multiplication had output N/2 output values per N input values representing a sub-sampling by a factor of '2', thereby having formed a transformed digital audio signal,
said apparatus including:

- means (ITRF) which perform a multiplication of an inverse transform matrix invMh, said inverse transform matrix having a size of N rows and N/2 columns, with each one of said transformed signal partitions (y) such that succeeding inversely transformed signal partitions (x') of length N are provided,
wherein said inverse transform matrix invMH is constructed by taking the left half of the inverse of a matrix

$$\begin{bmatrix} a & lr(a) & b & lr(-1*b) \\ b & lr(-1*b) & a & lr(a) \end{bmatrix},$$

wherein 'a' and 'b' are sub-matrices as defined above;
- means (ASS) which assemble said inversely transformed signal partitions (x') in an overlapping manner so as to form an inversely transformed digital audio signal (X'), whereby said overlapping is of size N/2,
and whereby the samples values of said inversely transformed signal partitions (x'), or the samples values of said inversely transformed digital audio signal (X'), or the values of said transformed signal partitions (y) are each scaled by multiplication with factor '1/N' or by a division by 'N' or by a corresponding binary shift operation.

5. Method according to claim 1 or 2, or apparatus according to claim 3 or 4, wherein N equals '8'.

6. Method or apparatus according to claim 5, wherein said transform matrix has the values:

$$Mh = \begin{bmatrix} 1 & 1 & 1 & 1 & -1 & 1 & -1 & 1 \\ 1 & 1 & 1 & 1 & 1 & -1 & 1 & -1 \\ 1 & -1 & -1 & 1 & -1 & -1 & 1 & 1 \\ 1 & -1 & -1 & 1 & 1 & 1 & -1 & -1 \end{bmatrix},$$

and said inverse transform matrix has the values:

$$invMh = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & 1 & -1 & -1 \\ 1 & 1 & 1 & 1 \\ -1 & 1 & -1 & 1 \\ 1 & -1 & -1 & 1 \\ -1 & 1 & 1 & -1 \\ 1 & -1 & 1 & -1 \end{bmatrix}.$$